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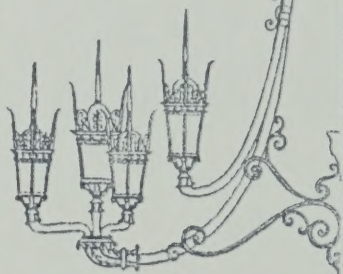
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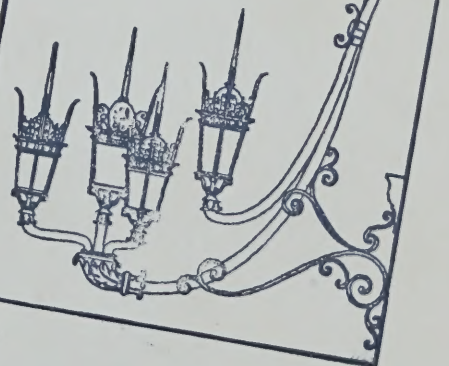
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TRAFFIC ENGINEERING REPORT

August 1, 1962

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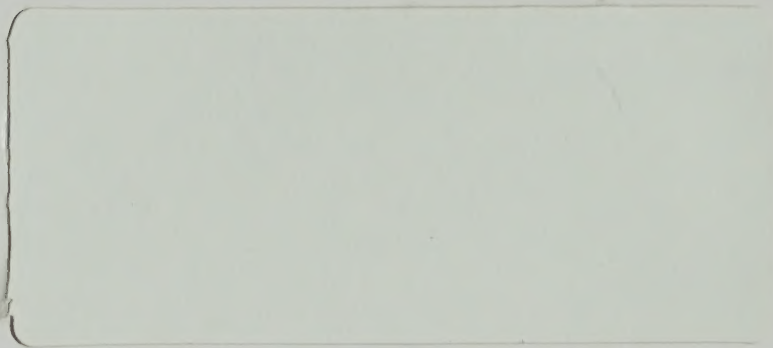
Robert C. Blumenthal Associates

CONSULTANTS

BOSTON

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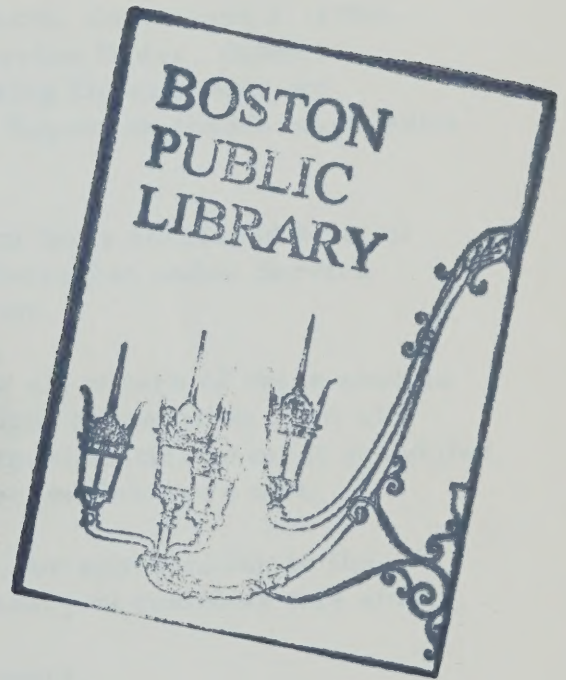
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MASSACHUSETTS TURNPIKE EXTENSION
TRAFFIC ENGINEERING REPORT

August 1, 1962

Prepared
By



ROBERT C. BLUMENTHAL ASSOCIATES
CONSULTANTS
BOSTON MASSACHUSETTS



Robert C. Blumenthal Associates

CONSULTING ENGINEERS

177 MILK STREET
BOSTON 9, MASS.

September 4, 1962

Mr. Thomas F. Carty, Commissioner
Boston Traffic and Parking Department
Mr. James W. Haley, Commissioner
Boston Public Works Department
Mr. Edward J. Logue, Development Administrator
Boston Redevelopment Authority

Gentlemen:

In conformance with the terms of our contracts, dated June 1, 1962, with the Boston Redevelopment Authority and Service Order, dated May 24, 1962, from the Boston Traffic and Parking Department, we herewith transmit our final Traffic Engineering Report on the Massachusetts Turnpike Extension into Boston.

Included herein, as applicable, are pertinent facts developed by civil engineering consultants working on the Boston Extension under Service Orders from the Boston Public Works Department.

As you are well aware, the time allotted for all phases of these studies was limited. It was necessary to secure maximum cooperation from all City Departments, State Agencies, and other Municipalities to meet schedules. We are pleased to note that in all cases, these schedules were met.

We wish to take this opportunity to express our appreciation to the many individuals who provided assistance necessary to complete this study.

Very truly yours,

ROBERT C. BLUMENTHAL ASSOCIATES

Robert C. Blumenthal

Robert C. Blumenthal

RCB/dc

Enclosure

CITY STAFF COORDINATING GROUP
TECHNICAL COMMITTEE

BOSTON REDEVELOPMENT AUTHORITY

Rocco A. Mancini
Committee Chairman
Acting Director,
Transportation Planning

Michael T. Gruenbaum
Principal Transportation
Planner

BOSTON TRAFFIC AND PARKING DEPARTMENT

Joseph M. Galeota
Chief Traffic Engineer

BOSTON PUBLIC WORKS DEPARTMENT

John J. McCall
Division Engineer

Frederick L. Garvin
Associate Civil Engineer

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MASSACHUSETTS TURNPIKE EXTENSION
TRAFFIC ENGINEERING REPORT SUMMARY

GENERAL COMMENTS

Important features of the proposed Extension design which should be emphasized are the extreme changes in vertical alignment of several city streets as they cross over the Turnpike-Boston & Albany Railroad alignment. This difficulty has resulted from two interacting features: (1) the shifting of the railroad to an entirely new location, generally on the southern edge of the right-of-way, necessitating a higher vertical alignment for most of the bridges; (2) the fact that Turnpike and Railroad lines cannot be easily lowered because of the interference from subways, utility lines, coaxial cables and a generally high level of ground water. Final plans and profiles may be improved somewhat by care in design, but it is now evident that if conditions "equal to the existing" are to be provided, additional construction costs will be required. A good example of this is the B. U. Bridge-Commonwealth Avenue intersection; although working profiles have not been received, it appears that grades up to six percent may be required on all approaches excepting the B. U. Bridge itself.

To expedite the proposed modifications in the following sections, it is obvious that City Departments should be permitted to review and comment on the design of structures carrying city streets across the Turnpike, or otherwise affecting city streets. Maximum flexibility in

design of these structures should be sought, in order to provide for possible future modifications in the city's street pattern.

SPECIFIC AREA COMMENTS

The following discussion may be followed by referring to Exhibit 1, appended to this Summary.

1. Brighton District

Existing crossings at Brooks, Parsons, Market and Everett Streets are retained, with minor changes in width and vertical clearance. The structure proposed at Market Street should provide for possible future widening. This can be done by designing and building elongated abutments and center piers, which can be done at nominal cost, thus making provision for placement of additional girders in the future, and hence widening of the roadway deck.

Revisions to the North Beacon Street Structure are being studied by the Turnpike Authority to improve the skew and sight distance while simultaneously permitting use of the existing structure during construction of the new facility. Provision has been made for a pedestrian overpass in place of the existing underpass at Franklin Street.

Cambridge Street and the major interchange of the Turnpike have been the subject of continuing discussion; significant design changes have already been agreed upon to insure flexibility, improved traffic operations and safety. The major criticism of the proposed design is the existence of a tandem break-up area within the confines of a Turnpike off-ramp. Tractors entering the area to pick up trailers will be crossing

the path of vehicles as they use the exit ramp.

A most important recommendation in this area is that the Turnpike Authority and the State Department of Public Works proceed with the design and construction of interchange ramps between the Toll Road and the proposed two-level Charles River Crossing of the Inner Belt, in accordance with the preferred recommendation of the Inner Belt report.

2. Boston University Bridge Area

An unequalled opportunity exists for developing relief from traffic congestion while at the same time providing a means for handling traffic during construction at this location. The basic plan enables improved intersection operation with a great deal of flexibility and provides an additional new 50-foot structure opposite Carlton Street in Brookline, which will be valuable during construction of the Commonwealth Avenue crossing. In conjunction with this proposal, the Saint Mary's Street Bridge would be replaced with a pedestrian crossing. Since this plan directly involves the M.D.C., Boston University and the Town of Brookline, the respective authorities have been contacted, and initial reactions to the scheme are favorable. (See Illustration, Page 42)

On the northerly side of Mountfort Street, between Carlton Street and Beacon Street, the Turnpike Authority should construct a wall or make other provisions so that the City can improve and widen Mountfort Street.

3. Kenmore Square-Charlesgate Area

A major point that should be made with respect to this area is that

although it is approximately mid-way between the Brighton Interchange and the Prudential Interchange and therefore well situated for ramp service to and from the Turnpike Extension, the nearest thing to service for this large area of the City is a proposal for a westbound on-ramp at the corner of Massachusetts Avenue and Newbury Street. The proposed ramp is unfortunately located in the most heavily travelled section of Massachusetts Avenue. In view of the existence of the River Crossing and the connection to Cambridge, this section of Massachusetts Avenue will certainly have to retain its present two-way operation and will, if anything, continue to have extreme congestion. Introduction of the proposed ramp to the Turnpike will add materially to this congestion, particularly by left turns onto the ramp. We feel that the ramp at this location is extremely undesirable and should be eliminated, particularly when adequate service from city streets to the Turnpike exists in the adjacent Prudential area. We would suggest that further study be given to serving the Kenmore Square area but that, in any event, the proposed Massachusetts Avenue ramp be eliminated.

Beacon Street and Brookline Avenue will be reconstructed with substantially the same cross section as there exists today, but the horizontal and vertical alignments have been modified. Raising the grades of Beacon Street and Brookline Avenue points to potential damages to nearby properties. It further leads to a proposed change in alignment of Brookline Avenue. This is one area where it is imperative that every effort be made to reduce the amount by which the city street grade is raised.

4. Prudential Center Area

The initial design of the Turnpike Interchange at Prudential Center was based on existing traffic patterns and an early Prudential Master Plan, the eastern portion of which is now temporarily being held in abeyance. The proposed modifications to the plans of the interchange are possible with certain revisions in the existing traffic pattern in the area. However, operational changes herein proposed are necessary not only to aid the Prudential Project but are part of an over-all one-way proposal which insures greater flexibility, improved efficiency, and increased pedestrian protection in the whole downtown area. We are prepared to proceed with the necessary changes in street operations, if the Turnpike Authority will agree to the proposed modifications. The proposed changes greatly simplify traffic movements in the area and tend to relieve Copley Square of a certain amount of undesirable traffic congestion. (See Illustration, Page 53 and Exhibit 4, appended)

Relocation of the Huntington Avenue access ramp to the intersection with Exeter Street eases the complicated access problems from Prudential Center to the Turnpike. Direct access to the Turnpike would be obtained from the one-way vehicular way about the Prudential complex.

The Turnpike Authority officials agree to the principle of this alteration, provided that negotiations with the Prudential planners be undertaken by the City. The proposal affords a substantial savings to the Authority, and could be more easily integrated with existing and

proposed traffic patterns in the area. The Stuart Street-Trinity Place access ramp could absorb most of the traffic approaching the Turnpike from Back Bay, South Cove and Downtown by the relatively simple means of making Stuart Street a major one-way arterial throughout its length from South Station to the Turnpike on-ramp and to Huntington Avenue.

Other proposed changes in the Huntington-Copley Interchange of the Turnpike permit further reductions in costs which could be applicable to more necessary construction elsewhere. Improvements to the Dartmouth Street egress ramp from the Turnpike would help to eliminate the need for an additional loop ramp to Huntington Avenue northbound, particularly if Dartmouth Street were made one-way from the ramp to Boylston Street. The land which is spared from highway development could be utilized for structures to complement the Prudential complex, and simultaneously bring more taxable property to the City. The elimination of this rather long egress ramp to St. Botolph Street and Huntington Avenue enables a simplification and narrowing of the Huntington Avenue structure over the Turnpike.

We have proposed shifting the southbound Huntington Avenue egress ramp to the Prudential Center side of Huntington Avenue instead of the middle of the Avenue to permit direct access from the Turnpike to the Prudential Ring Road and parking areas. Turnpike Authority representatives have agreed to this modification.

All of the existing bridges in the Prudential Center Area, from

Massachusetts Avenue to Dartmouth Street, are to be replaced with minor alterations to vertical alignments. Horizontal alignments are relatively unchanged, but some cross sections have been widened. The Boylston Street structure has the unique problem of juncture with New Dalton Street on the structure itself, but this has presented no insurmountable difficulty of design or coordination.

5. South End-South Cove

From the Prudential Center to South Station, the Turnpike Extension passes between congested sections of the City which are to be affected by the massive renewal program now underway. Three major renewal projects have been instituted along the Turnpike alignment, and studies to improve the complex street pattern and make proposals for revisions in street operations are being undertaken. Particularly apparent in all deliberations concerning this area was the need for maximum flexibility of design to enable the renewal process to be carried on successfully, while avoiding interference with existing patterns of traffic flow and street use until other street patterns or operational changes can be affected.

All of the existing structures which now bridge the railroad from Dartmouth Street to Harrison Avenue, inclusive, are to be replaced. Several of these structures are to be somewhat modified in width or alignment, as indicated in Table II, attached. In each instance, the Turnpike Authority should rebuild the entire structure spanning both the Boston & Albany and the New Haven Railroad tracks (leased from

the Boston & Providence Railroad.) In such cases, the City can act as intermediary between the Turnpike Authority and the New Haven management. This principally affects two bridges which are to be substantially widened: Washington Street and Harrison Avenue. Shawmut, Tremont, Arlington, Berkeley, Clarendon, Columbus and Dartmouth, all of which bridge the Turnpike, the B&A and the New Haven tracks, do not have to be widened extensively, and problems are therefore mainly concerned with meeting existing vertical alignments.

The remaining structure in this section is the Broadway Bridge, which has provided the Turnpike engineers with difficult problems in design. Horizontal alignment cannot be changed because of the under-clearance requirements of the Turnpike and because of a utility line which must be provided at the intersection with Harrison Avenue. In order to obtain proper vertical clearance, the structure may have to be constructed on a through girder design rather than deck construction, as are the remainder of the Turnpike crossings. Proposed changes of the street pattern in the South Cove Renewal Project area indicate that a direct alignment of Broadway cannot be maintained if adequate parcelization is to be realized. Coupled with this is the existence of the difficult intersection of Broadway, the Central Artery and Albany Street and Herald Street. These reasons have prompted the study of the elimination of the Broadway Bridge from the construction plans of the Turnpike Authority. The basic in-town movement using the bridge can be transferred to Dover Street, thence to Berkeley or Tremont

Streets, or to Herald Street and Washington Street. Dover Street, which is already one-way northbound from Albany Street, is destined for further widening and improvement. These studies indicate that we can recommend the elimination of the Broadway Bridge from their construction plans. The elimination of the Broadway structure would create a substantial "credit" for use elsewhere as required.

The Turnpike Authority proposal for a marginal road to parallel the Turnpike from Hudson Street to Arlington Street is an adequate replacement of the access now available for present inhabitants, businesses and institutions. We recommend that the road be connected to Tremont Street and that the land between Tremont and Arlington within the Turnpike taking be reserved until the City determines its optimum disposition as part of a renewal study in the area.

6. South Station Interchange

The design for the interchange with the Central Artery is under separate study and a report will be forwarded shortly.

Conclusion

A complicating factor in the work of reviewing the Turnpike plans has been the lack of plans and profiles based on accurate survey data. Requests for such information have been made to the Turnpike Authority and its consulting engineers, but only a few detailed plans and little profile data have been presented at this writing. In the absence of detailed proposals, we have relied in large measure upon the preliminary plans and profiles developed by the Authority prior to its sale of bonds for the construction of the Extension into Boston, and upon meetings with their staff and consulting engineers. In view of this, it is extremely important that we continue liaison with the Authority's staff.

MASSACHUSETTS TURNPIKE EXTENSION STUDY

INTRODUCTION

The Massachusetts Turnpike Authority is engaged in the construction of an extension of the Massachusetts Turnpike, a limited access toll highway facility, from the Newton line some 5.8 miles to a juncture with the Central Artery in the South Station area of Boston. In so doing, some 25 major vehicular structures and several smaller pedestrian facilities within Boston are involved. Land takings in the millions of dollars, with corresponding loss in tax revenue, are required and may be appreciably affected by certain design features in several critical areas.

While the design and construction of the Turnpike Extension proceeds, planning for adjacent renewal project areas from the Central Artery westerly into the Back Bay section of the City is gaining momentum. It is therefore not only logical but imperative that any necessary changes in traffic circulation patterns required to serve changing land uses and parcelization be reflected in the location and design of the Extension in these areas.

In other sections where the planning program is in preliminary stages, or where none is contemplated for some time, it is most important that the existing traffic pattern be as efficient as possible and the geometrics of Turnpike over-or under-passes be developed with the

most efficient and flexible traffic operation possible to handle present and future traffic volumes.

The Massachusetts Turnpike Authority presented their scale plans (1"=100') for the Turnpike Extension to the City of Boston. These plans had been the basis for the Authority's construction cost estimates and the subsequent approval of the Financial Community which provided the financing. These plans, and supporting profiles, represented what the Turnpike Authority proposed as a replacement of the existing means for traffic circulation which would, in every case, need to be demolished to permit the construction of the Extension. Turnpike Authority representatives, acknowledging the problems of relating to the City traffic patterns, asked City agencies to propose any changes that might be necessary to integrate the preliminary designs with any plans the agencies may have for existing or new street patterns.

With the above as background, it became obvious that time for concentrated study and plan preparations by the various City staffs directly involved (Boston Redevelopment Authority, Boston Public Works Department and the Boston Traffic and Parking Department) was impossible with current work loads. The Department heads agreed to extend their staff resources through the use of consultants in the following manner: Robert C. Blumenthal & Associates were retained to do the overall traffic planning with responsibilities delegated from both the Boston Traffic and Parking Department and the Boston Redevelopment Authority. In addition, the following civil engineering firms were assigned specific sections of the Turnpike Extension to report on

on structural features, utility relocation and other physical problems.

<u>Names</u>	<u>Section</u>
William A. Fisher Company, Inc.	From the Newton line to east of Cambridge Street
Charles H. Maguire & Associates	From east of Cambridge Street to east of Eastgate
Fay, Spofford & Thorndike, Inc.	From east of Eastgate to east of Dartmouth
Edwards and Kelsey, Inc.	From east of Dartmouth to and including interchange at South Station

All consultants proceeded under the direction of a Coordinating Committee composed of staff representatives of the three City agencies participating.

The Traffic Planning Consultants have spent considerable time in orientation sessions with the Boston Redevelopment Authority Urban Planning Staff and in review of their proposals and generalized traffic circulation plans. The Traffic Planning Consultants also met with both the design Engineering Consultants and the Coordinating Committee and have participated in what has developed into a weekly session with the Committee, Turnpike Authority Representatives and the overall Project Engineers to iron out specific problems and develop coordination between planning and design objectives.

This report presents the results of this cooperation and the extent of agreement on basic geometric design and operational features developed to date. The reports relative to cost estimates, design standards, utility relocations and other pertinent structural engineering features proposed by the design Engineering Consultants have been reviewed and are incorporated into the proposals as part of this report.

DATA COLLECTION

Introduction

In order to intelligently assess traffic planning proposals and particularly in the initial development of new systems, basic traffic volume data are required. For this reason, a service order to the Traffic Planning Consultants was issued by the Boston Traffic Department for the compilation, collection and presentation of essential traffic planning data in connection with the Turnpike Extension Study.

Data Sources

The M. D. C. and the Boston Traffic Department maintain traffic counts of important intersections within the study area and these two sources provided the major portion of the traffic volume information required.

The Boston Traffic Department also furnished new machine recorder counts where existing traffic volume information was considered to be out of date.

Additional information necessary to the compilation of overall traffic flow diagrams was obtained by the Consultant. The above includes the estimated 1965 average daily traffic flows on the mainline of the Turnpike.

Data Presentation

The resulting traffic flow diagrams relating directly to the Turnpike Extension are appended to this report in graphic form. On strip maps, at appropriate scales, the morning and evening peak hour and annual average daily traffic flows are presented. Except in the case of 24 hour machine counts, all other traffic data was obtained from 10 or 11 hour

daytime manual counts. The data collected was adjusted to obtain an annual ADT which was used on the flow diagrams.

PLANNING ELEMENTS

Basis of Traffic Planning

The basis for proposals stems from an attempt to provide for maximum flexibility in the street pattern. The proposals are designed to allow for operation under

- a. existing traffic flow patterns, using existing streets
- b. a proposed revised traffic flow pattern, using existing streets
- c. possible new street patterns that may evolve from planning now under way in specific renewal projects.

The basic traffic planning conclusions stem from the knowledge that traffic seeks its optimum path, with time the basis of choice, in any urban street system. Therefore, if a system is provided with a sufficient number of well designed and controlled arterial routes, peak hour traffic congestion should be limited to those occasions when accident or breakdowns disrupt the normal operation of the system. The above presupposes that streets needed for the peak hour movements will be available for the purpose intended.

The System

In order to function smoothly, the street system must be assured the optimum geometrics practical with available rights-of-way. Where urban renewal projects are underway or in the planning stages, much can be done to insure proper geometric layouts of circulation routes required to service proposed land uses in the immediate area, in addition to providing for necessary through traffic movements. The proper design must be based upon a reasonable traffic operational plan which has as its dual objective

the most efficient use of the street system consistent with planning objectives.

In assuring this efficiency, the traffic planning principle is to maintain the simplest control features at the problem locations (i. e. , the intersections of major arterials) with the most significant aid in this regard being the ability to effect two-phase traffic signal operation whenever possible. Maximum capacity and ease of flow are assured whenever an intersection can be operated with but two vehicle movements being assigned the right-of-way in an alternating manner. The introduction of a third movement into the signal cycle introduces a minimum intersectional clearance time in addition to that required to impart momentum to a waiting line of vehicles. In urban areas, particularly in the central business district, where heavy pedestrian flows occur, it is particularly important to minimize the total number of signal phases since the inclusion of an exclusive pedestrian interval further reduces the vehicular capacity of an intersection.

Having established that maximum vehicular and pedestrian intersectional capacity depends upon two-phase signaling, we may look to the most efficient operation for streets in general. Regardless of whether a street is to serve its primary function as a vehicle carrier or this latter is to be combined with the curb side parking of vehicles, a one way operational pattern is the most efficient and safest use of available street width.

Efficiency of one-way traffic movement is most evident when an investigation of intersectional operation is made. If two intersecting streets, each with two free flow moving lanes, are changed over from two-way operation to one-way, the number of intersectional conflicts (direct cross and merging maneuvers) are reduced from 24 to 6.

With the institution of two-phase signalization for free flow, the resulting vehicle conflicts drop from eight (four per phase) in the case of two-way operation to none under one-way operation.

Furthermore, with a true, or modified grid, street pattern, a one-way operation of the major arterial street system permits greater flexibility in attaining a progressive traffic movement via a coordinated progressive signal system. It also brings about a reduction in most types of accidents though simplification of driver choices and decisions, elimination of headlight glare and increased pedestrian protection.

When one approach is stopped, the pedestrian may be assigned exclusive use of the crosswalk on the near side of this approach for the entire duration of the vehicular stop, less required clearance intervals. Usually turning vehicles are in the minority and may often be provided with separate turning lanes to quickly clear the intersection thus enabling the assignment of an exclusive walk interval on the far side of the intersectional situation discussed above.

Existing Traffic Operations

Boston, in the general study area, is fortunate in having successfully operated a one-way system which is particularly extensive in the Back Bay section where a grid system with more or less uniformity in block length made the adoption of the system quite simple.

In the downtown sections of the central business district, a partial system was developed as a natural consequence of the extremely narrow streets, and relatively heavy vehicular and pedestrian flows.

With the development of the limited access facilities such as Storrow Drive, the Central Artery and now the Massachusetts Turnpike Extension, the desirability of establishing additional one-way streets to afford better access to such facilities at a limited number of locations is readily apparent. Thus downtown Boston's one-way street system has developed by logical extension fostered by the necessity of serving ever increasing volumes of vehicular and pedestrian traffic. Considering the present development of urban plans for Boston, it appears that Boston's traffic will continue to increase in the foreseeable future. It is therefore evident that to cope with these evermounting volumes it will be necessary to effect logical extensions of, or alterations to, the present one-way traffic system.

RENEWAL PLANNING

Introduction

A series of orientation meetings attended by the Traffic Planning Consultants and the Boston Redevelopment Authority Urban Planning Staff were held to familiarize the Consultants with the general aims and goals of the urban plan now under development.

One of the prime factors in the traffic circulation scheme proposed by the B. R. A. staff was a dependence on dual service roads adjacent to the Turnpike - Railroad alignment. This system of parallel service roads was shown on the Turnpike's 100 scale plans and extended from the Central Artery westerly via Castle Street to the Arlington-Tremont intersection on the south. To the north a new service road from the Broadway Bridge to the Arlington Street on-ramp was indicated.

In the lengthy weekly sessions with the Turnpike Authority officials and their engineering consultants, the following views directly relating to early proposals for traffic circulation plans were voiced by the Authority.

1. While considered desirable, the construction of an additional off ramp between Dartmouth Street and the South Station Terminal area was not undertaken because it was simply not economically justifiable when alternate means of providing the

identical access exists elsewhere and could hopefully be improved.

2. The principal reason for constructing a parallel service road on the north side was to replace local access which would be cut off by necessary Turnpike land takings and roadway construction. The Turnpike Authority's representatives indicated there was no need for the service road to directly feed the Arlington Street on-ramp.

Directly related to the Downtown and South End proposals is another problem, or series of problems, with a most reasonable solution. The elimination of Broadway as an obstacle to the development of super blocks is a prime aim of the planners.

It further appeared that the complete elimination of this rather heavy through traffic movement would be desirable if possible.

The feasibility of providing an alternate path for the present inbound Broadway movement has been studied in detail. It is entirely feasible to eliminate the Broadway movement and by a simple traffic pattern afford an equally good route with a simplification of intersectional control making the proposal even more attractive.

The alternate route involves the use of Dover Street, either from the Central Artery or from Dorchester Avenue, one-way to Tremont, thence via Tremont to Broadway and on to Charles. Alternate routes are available depending on the role assigned Harrison Avenue, Washington Street and Shawmut Avenue. The return trip would use Arlington Street to Castle to reach the Artery or South Boston via the Broadway Bridge over Fort Point Channel.

The final problem which arose concerns the design of the Broadway Bridge over the Turnpike. The Turnpike consultants, in our latest weekly meeting, indicated that there was increasing concern over the ability to design the proposed structure within the limits of a reasonable and prudent design because of the extreme skew at both the Harrison Avenue and Castle-Albany Street intersections utilities involved and the required blending into the existing structures.

It would, therefore, appear that the elimination of the proposed Broadway span over the Extension will serve the aims of Renewal Project planning for the area while an equally good alternate route is available with the opportunity to improve traffic control through a simplification of operations.

And the opportunity of obtaining another "credit" of substantial size to offset "debits" which will be required in other locations where widening or lowering of Turnpike and overpassing structures is indicated.

In general, the existing means of North-South access over the rail barrier in those areas of intensive planning will be required to serve the local area and to provide alternate means of by-passing local congestion due to accident, fire, etc.

From a traffic planning viewpoint, it should be pointed out that if a parallel service road immediately north of the Turnpike and extending to Arlington Street is to be a necessary part of the traffic circulation scheme, then the simple two-phased signalization scheme developed at a new Arlington-Tremont intersection and presented on Exhibit 1 (Sheet 2) will degenerate to a three-phase operation with all it implies. Such an occurrence would be most unfortunate from a traffic planning and operations viewpoint.

Present planning proposals for the South End Project should include the improvement of Dover Street as a major arterial street to provide access to the downtown and to the Prudential

Center and the Back Bay as well. Similar improvement is required to develop the full potential of Castle Street.

Discussions with the planning staff relative to the merit of retaining any or all of Columbus Avenue north of the Turnpike prompt the following reactions from the Traffic Planning Consultants.

In any field of planning, it is wise to have available alternate means and flexibility in operating any type of system. In traffic planning, this "safety valve" is perhaps more necessary than in any other systems design since it is known that local congestion due to fire, breakdown, accidents, etc. can occur at any time, day or night.

We, therefore, within reason, desire that a sufficient number of good alternate routes be afforded to handle emergency situations and the normal traffic growths to which we have become accustomed.

Thus the complete elimination of Columbus Avenue north of the Extension is not an acceptable proposal from the traffic planners' standpoint. However, the proposed traffic circulation plan does deemphasize the role of Columbus Avenue from Arlington-Stuart up to and including Park Square to the point where it would only service abutting land uses and would no longer carry any through traffic.

In emphasizing the importance of Columbus Avenue and Tremont, it should be pointed out that, however regrettable, they are the only existing major arterial streets capable of serving as main access corridors through the South End from

the Inner Belt and Southwest Expressway.

South Station Area

The proposals for redesign of the South Station Area interchange between the Extension, the Central Artery and potential garage facilities prepared by the Boston Redevelopment Authority Urban Planners is still under study.

However, initial reaction by the Turnpike officials indicated several observations which were as follows:

- a. Present commitments by the Authority to the Boston and Albany Railroad for the preservation of trackage and access in the general area between the Boston Edison facilities and a southerly extension of Atlantic Avenue virtually prohibit Turnpike construction in this area.
- b. Further, the design criteria for the Turnpike are such that below-minimum standards would be required in skirting the Edison Station with any elevated structure.
- c. With regard to the elevated structure over Kneeland Street, surprise was expressed that it was considered esthetically acceptable but the opinion was expressed that another issue of "Air Rights" would be involved and that the Authority could possibly be held Libel for damages due to restriction of "Air and Light" relative to abutters.

The subject of workable profiles was broached and the indication was that there would be major difficulty in effecting vertical alignment under any scheme.

It also appears that planning is proceeding to assure future access to the proposed garage over the South Station area if this project becomes a reality.

Study of the possibility for saving some land within the interchange for other purposes will be pursued by the Authority, however, it was clear that any other use was incidental to the primary task of designing the best possible interchanging with the available land and without further sacrifice of design standards.

Several schemes for revisions in the interchange have been prepared for the purpose of permitting the construction of a multilevel parking facility within the confines of the interchange proper. This structure would be provided with direct access to both the Central Artery and the Turnpike Extension as well as to the local street system, via Kneeland Street.

In summary, the points made relative to the urban planning endeavors in the downtown and South End Project area are as follows:

1. The Turnpike Authority considers any additional off ramp in the Project Area desirable, but totally uneconomical (even if this could be accomplished without negotiating an agreement with the New Haven Railroad.)

2. The Turnpike Authority's proposal for a parallel service road was made primarily to restore local access, and the service road should be so treated. It was agreed that the service road should terminate at Tremont Street, and that land between Tremont and Arlington Streets within the Turnpike taking reserved until the City determines its optimum disposition as a part of a renewal study of the area.
3. An alternate means for handling present Broadway traffic is available via Dover and Tremont Streets, enabling the discontinuance of the Broadway Bridge structure over the rail-Turnpike Extension alignment. This proposal simplifies intersectional control at the Central Artery underpass, Broadway and Albany Streets. The elimination of this structure would be the best single step to insure the availability of Broadway as a local street enhancing the plan objectives of South Cove and South End. The deletion of the proposed Broadway span would present another "credit" for the City relative to the Turnpike access "package".

4. Columbus Avenue under the proposed traffic scheme could be deemphasized from Arlington-Stuart to Park Square to the point where it would service only abutting land uses. However, it would be a major arterial from Arlington-Stuart outbound.
5. The current plans for the Inner Belt and Southwest Expressway are reported to utilize the Columbus-Tremont Street couple as the major access-egress corridor to the Inner Belt and form the extension of the Southwest Expressway into Boston.

Until such time as an alternate means for handling this traffic is planned and approved, these two streets must serve present and future traffic desires.
6. With respect to the B.R.A. Studies of the Extension-Central Artery interchange area, the Turnpike is continuing to study the possibility of saving land for other development within the confines of the interchange. However, the design of the interchange must take precedence over other considerations.

The Authority is proceeding with their design studies on the basis that future direct access between the Turnpike Extension and a Parking Garage over the South Station is desirable and should be accommodated in the interchange design if possible.

This report presents suggestions for certain changes in the design of the interchange which would permit the construction of a multilevel parking facility within the interchange. Plans for the above will be presented in the section dealing specifically with the Interchange-South Station Area.

Moving a portion of the interchange north of the Boston Edison facility to a second level over Kneeland Street was considered objectionable because of the necessity of lowering horizontal alignment design standards and the possibility of liability in cutting off abutters from normal access to "Air and Light" by an elevated structure.

Inner Belt Expressway

The study of the implications to local circulation planning of the Inner Belt Expressway was based on the latest plans for this facility with the knowledge that a certain degree of flexibility in its final design will be possible.

The study of traffic circulation in connection with developments within the Inner Belt reveals that a connection between the Massachusetts Turnpike Extension and the Inner Belt Expressway east of the Brighton Yards interchange is highly desirable from a practical traffic service and operational viewpoint.

The recent publication of the revised plans for expressway construction in the Boston Metropolitan Area recommends the coordination of design and collaboration to achieve the most economic method of constructing the proposed interchange. It is of major importance that the design of the Turnpike Extension-Inner Belt Interchange be completed prior to actual construction of this segment of the Turnpike Extension.

The desirability of providing direct interchange between the Extension and the South Boston Area and a possible future tunnel; or bridge, crossing of Boston Harbor is theoretically

an ideal solution to relive traffic pressure on the Central Artery and the existing Bridge-tunnel system. If such a connector is to become a practical reality, the provision for this facility must be provided for by immediate design accommodations in the Extension-Artery interchange complex.

DESIGN STANDARDS

Priority Reports

The consultants were requested by the Committee to make necessary investigations of certain proposed Massachusetts Turnpike Extension under or overpass structures and resulting intersections and their approaches on a priority basis. The reports of these investigations were considered a prerequisite to issuing an approval to the Massachusetts Turnpike Authority to proceed with the design of the above structures. The approval was to be based on mutually agreeable geometric design features to be established on a structure-by-structure basis.

Our appraisal of the proposal was necessarily limited to the preliminary 1"=100' scale plans and profiles of the Turnpike Authority. The only exceptions were Cambridge Street, where the Turnpike Authority's consultants provided a 50 scale drawing, and the Central Artery interchange, where 20 scale plans were presented. The priority list of structures was as follows:

<u>Location</u>	<u>Structure Type</u>	<u>Number</u>
Brooks Street	Turnpike Bridge (over)	34
Brooks Street	Railroad Bridge (over)	35
Parsons Street	Turnpike Bridge (over)	36
Parsons Street	Railroad Bridge (over)	37

<u>Location</u>	<u>Structure Type and</u>	<u>Number</u>
No. Beacon Street	Turnpike Bridge (over)	39
Market Street	overpass of Turnpike and Rail	41
Cambridge Street	overpass of Turnpike and Rail	101
Cambridge Street	overpass of Turnpike ramps and rail spur	105
Beacon Street	Overpass of Turnpike and Rail	50
Brookline Avenue	overpass of Turnpike and Rail	51
Massachusetts Avenue	overpass of Turnpike and Rail	54
Boylston Street	overpass of Turnpike and Rail	55

A quick review of the 100 scale preliminary plans indicated that in many cases major changes would be necessary due to lack of sufficient field survey information.

As a result, only general comments were made in memorandum form relative to proposed alignment grades and other traffic operational features of the indicated design including safety and ability to handle expected traffic volumes.

In the case of Structure No. 101, Cambridge Street, a scheduled meeting of Committee Members and their consultants with the Turnpike Consultants produced general agreement as to the plan geometrics and resulted in the acceptance of a bridge structure providing two 34 foot pavements with provision for a six foot median and an easterly sidewalk of seven feet and a westerly sidewalk of eight feet. It was further agreed that the interchange with Lincoln, Mansfield and Royal Streets with Cambridge Street, as shown on the Turnpike 50 scale plan, be

relocated and combined with the present Mayflower Street-Cambridge Street intersection. This revision would permit a standard bridge cross section without the necessity of flaring out the median while on bridge structure and by improvement in grade and better traffic operation would greatly aid the movement of all vehicles, (but particularly heavy commercial types) on the northerly approach to the Cambridge Street Bridge.

At the time of the above conference, a lack of survey information made it impossible to present a workable profile of the entire bridge area and, therefore, no further agreement was possible pending the receipt of survey information and the development of final profiles for further discussion.

Final Design

The weekly meetings between Turnpike officials, the City's Turnpike Extension Coordinating Committee and respective consultants have gradually developed agreement as to such design features as location, pavement and sidewalk widths, median placement, and pedestrian structures for a number of locations. Other locations are under restudy by the Turnpike Authority and still others are being held pending decisions of other agencies involved or the receipt of field survey information.

In this section, a recapitulation of important points and present areas of agreement will be presented on a location by location basis commencing at the Newton line and working easterly.

The outstanding design feature of the entire Turnpike Extension as it traverses the City is the extent to which the Turnpike Authority proposes to raise existing City streets to accommodate the Turnpike and relocated rail facilities.

The regrettable features can only be completely eliminated in many instances by resorting to a waterproof and ballasted Turnpike-Rail design and the construction of syphons to provide continuity of sewage facilities crossing the Extension. The discussion can be followed with the aid of Exhibit 1 (Sheets 1 and 2) and the Turnpike Authority's 100 scale plans.

Brooks Street

The existing cross section of a 26 foot roadway with two seven foot sidewalks is certainly a minimum to be considered for reconstruction. The alignment in both the horizontal and vertical appears quite adequate. In the design of the Northeast Turnpike Wingwall (Structure No. 101 on the Turnpike Plans) every attempt should be made to enable widening of the signal approach to Nonantum Road to permit storage of vehicles in two lanes. The Turnpike proposed to eliminate present access over Brooks Street from Riverview Road and is currently making a study of the grades to see if replacement of access at this point is feasible.

It is our opinion that the narrow street parallel to the Brooks Street underpass which leads to Riverview Road must remain one way in this same direction.

Parsons Street

There are revisions to be made at this location once field survey is obtained. Basically, it appears that the termination of Riverview Road at Parsons Street will have to move southerly to accomodate required grading. The existing cross section is composed of a 34 foot roadway and two eight foot sidewalks. The pavement width should be increased to 36 feet to permit two lane storage at the signalized intersection just north of the Turnpike. To equal the existing right-of-way, two seven foot sidewalks would be required. The Turnpike will have more detailed plans available soon with accurate profiles.

North Beacon Street

This entire location is being restudied by the Authority. We are most concerned that with the proposed reverse curve alignment and limited sight distances on the approach to a signalized intersection on Birmingham Parkway, a real accident potential would be developed.

The Turnpike has indicated its desire to build this structure entirely separated from the existing so that the present facility may remain in service while construction of the new one is proceeding. From the 100 scale it can be seen than an increase in the skew angle by holding the northern end of the line will separate the two structures sufficiently and will increase the sight distance appreciably.

The agreed upon cross section for this street under is a 26-foot southbound pavement and a 30-foot northbound pavement with flanking eight-foot sidewalks and an eight-foot median which must accommodate a bridge pier. The unbalance in pavement widths will permit the storage of three lanes of traffic at the signals required at Birmingham Parkway. A supermarket is scheduled for construction which will have Birmingham Parkway as one of its access points so that traffic volumes will be increased somewhat over existing flows on the parkway and signalization will be required.

Market Street

The existing Market Street cross section is 70 feet, with 50-foot pavement and 10-foot sidewalks. The agreed upon design would enable four moving lanes with sufficient room for a shadowed left-turn slot on a 54-foot pavement with eight-foot sidewalks.

For maximum flexibility, the structure proposed at Market Street should provide for possible future widening by designing and building elongated abutments and center piers to provide for additional girders in the future.

This is the first in an almost unbroken series of structures scheduled for an increase in the evaluation of the bridge structure. Preliminary profiles at this location indicate

an increase at mid span of something over two feet with the possibility that this can be lessened when final profiles are established.

Everett Street

The present structure, with angle points most noticeable to the user, has a 30 foot pavement. The cross section agreed upon for the new structure has a three foot safety walk on the easterly side to discourage use by pedestrians and a seven foot pedestrian sidewalk on the westerly edge of a 30 foot roadway pavement. The Turnpike officials agreed to study the possibility of improving the southerly approach to this structure. Again, only preliminary profiles are available at this time and final profiles await completion of field surveys.

Franklin Street

To increase the length of the heavily used pedestrian underpass at Franklin Street would be undesirable since a covered structure approximately 250 feet in length would be required.

The Turnpike has prepared feasibility studies for alternate locations for a pedestrian overpass and the agreed upon scheme ramped from Cambridge Street over the existing underpass to a point on the southerly edge of the new rail alignment and then angled, skewed to the rail and extension, northeasterly to a point just north of the opposite rail location where it could begin the ramp down to meet Lincoln Street opposite Franklin.

There was general agreement that, because of the travel paths, stairs would receive little use and the indicated ramp grades were no greater than 15 per cent.

The subject of a future vehicular crossing over the Turnpike-Rail in the vicinity of Franklin Street was discussed. General agreement of those present was that the exact location could not be determined at this time and, further, there would be ample opportunity to drop piers beside the rails and single span the Turnpike in the future. The proposed Turnpike median is eight feet in width and accommodates piers at Cambridge Street. However, Turnpike officials indicate that its use for future spans would require large footings and the opening up of the Median area and resulting blockage of the Turnpike would be resisted where a single span over the Extension would be entirely feasible.

Cambridge Street

As previously indicated, agreement as to a cross section of the structure (#101) over the Extension established an eight foot westerly sidewalk, two 34 foot pavements separated by a six foot median and a seven foot easterly sidewalk.

No working profiles are available but the vertical alignment is extremely severe for a major arterial route with expected grades in excess of the maximum for Turnpike ramps. The Turnpike consultants have indicated that existing utilities in profusion at this location would make appreciable improvement in vertical alignment by lowering the Rail-Pike, extremely expensive.

However, the full impact of the grades will not be known until the complete survey data is developed and final profiles drawn.

Present 1"=100' scale plan and profile indicate that Linden Street just south of the Bridge will be retained in service, but the profile indicates a change in grade of over five feet. The heavy fill required in the northern approach to Structure 101 required rather drastic changes in the 1"=100' scale plans since fills of 19 and 20 feet at Lincoln, Mansfield and Royal Streets are required. It will be impossible, and quite undesirable from a traffic operations standpoint, to hold to the 1"=100' scale layout. The new grade for Cambridge Street meets the existing at Mayflower Street and a 50 scale plan has been developed showing a consolidation of all traffic from Lincoln, Mansfield, and Royal Streets at Mayflower Street. The new Lincoln Street would be extended to Mayflower Street via Empire Street.

The second Cambridge Street Bridge (Structure 105) over the rails and the Extension's ramps has been studied in plan at 50 scale without benefit of finished profiles. We find that Cambridge Street is being realigned from the straight and level to curvature in both the vertical and the horizontal. A maximum six percent up-grade is indicated. Agreement as to the required cross section of the structure itself produced a pair of 34-foot pavements separated by a six-foot median and flanking six foot walks. Excessive grades have forced a relocation of

of the planned access at relocated Dedham Parish Road to Windom Street where Cambridge Street meets existing grade. It is also at the midpoint of a horizontal curve giving better visibility at the new intersection.

We recommend that the only Cambridge Street median openings be located at Mayflower Street, North Harvard Street and at Windom Street. With new alignment and higher speed Turnpike traffic in the area, the above is suggested not only for the safety of local residents, but for greater ease in required signalized traffic control.

The northern end of Structure 105 is still under study with grade and traffic control requirements forcing alteration of the 100 scale plans. The use of the area for the breakup of dual trailer trucks is presenting design difficulties. However, further study of the area by the Turnpike Authority consultants is continuing. It is hoped that improvement in grades will permit an increase in the safe-stopping sight-distance of 250 feet (35 miles per hour design speed) indicated on preliminary profiles.

Boston University Bridge Study

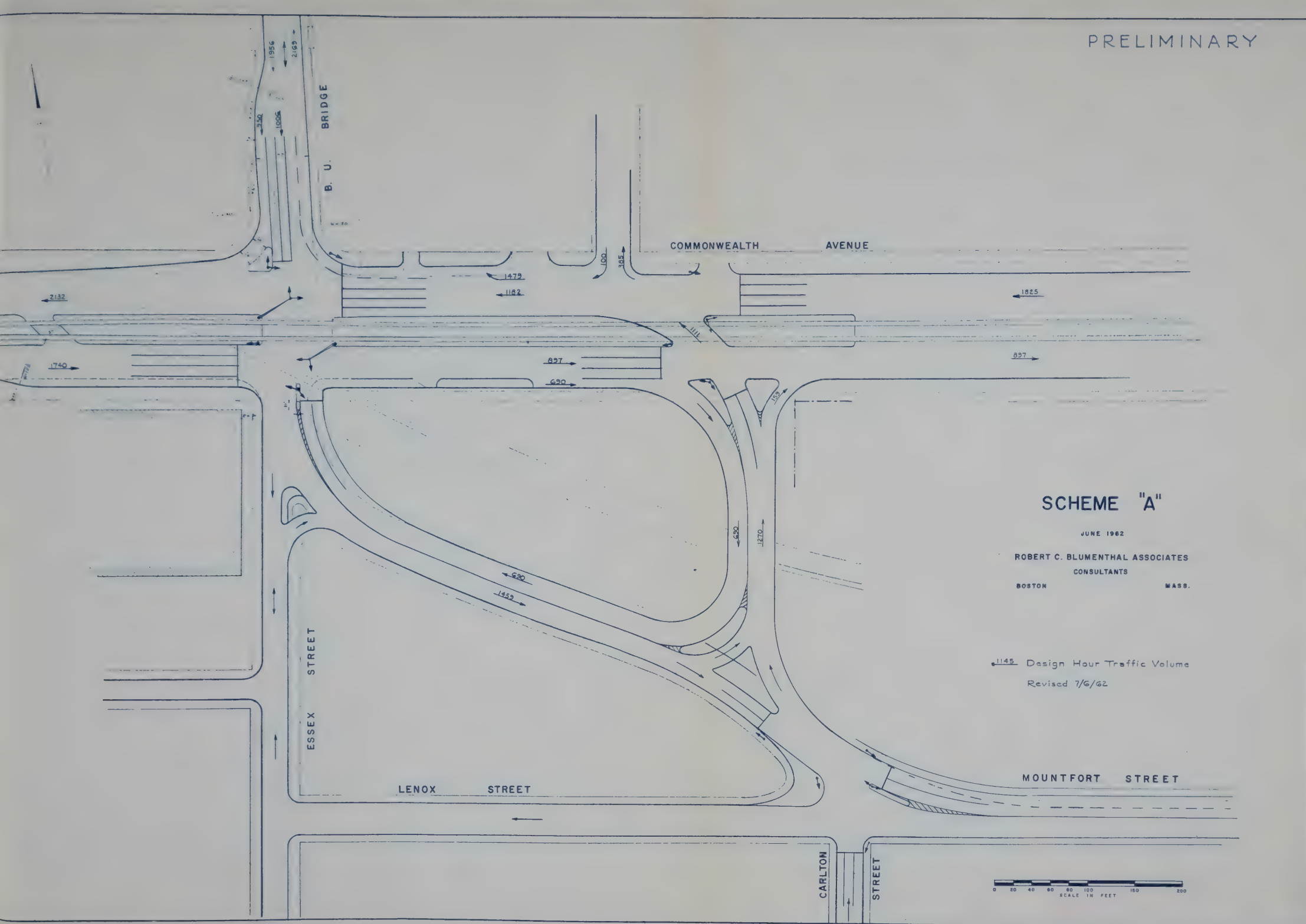
The Consultants were requested to study the implication of Turnpike construction in relocation to possible traffic re-design on the Boston University Bridge-Commonwealth Avenue. The immediate intersection is presently controlled by Metropolitan District Commission traffic officers during peak hours without

the benefit of signal control. Because of the economics of the situation and profusion of political and governmental subdivisions involved (M. D. C., City of Boston and Town of Brookline) prior attempts at an overall solution to the handling of traffic at the Boston University-Commonwealth Avenue intersection have not met with any real success. With the building of the Turnpike extension came a real, and rather final, opportunity to see if a better solution could be worked in cooperation and conjunction with the Turnpike construction.

Several schemes were explored by the consultants with the result that the final scheme proposed, shown on the following page, encompasses all of the much needed physical changes proposed by the M. D. C. working as they were within the immediate confines of the intersection and its approaches.

Because of the Turnpike's need to maintain traffic movements in the area, the possibility of building a permanent facility which was substantial enough to carry large traffic volumes and capable of being worked into an ultimate design to substantially increase the traffic carrying capacity of the subject intersection, was explored.

It then appeared that the new facility might well serve the functions of the existing St. Mary's Street Railroad Bridge permitting the elimination of this rather narrow and underdesigned structure once the Turnpike construction was accomplished.



SCHEME "A"

JUNE 1962

ROBERT C. BLUMENTHAL ASSOCIATES
CONSULTANTS
BOSTON MASS.

1145 Design Hour Traffic Volume
Revised 7/6/62



There developed two schemes for handling the problem, both utilizing the new structure for handling the Commonwealth inbound left turn to the bridge. The final scheme which seemed to win approval as being the most workable from an operational standpoint passed the above left turns directly through the subject intersection and via a direct right turn onto the proposed structure to swing back and across Commonwealth Avenue on a direct crossing movement.

In conjunction with the above, the northbound movement over the Boston University Bridge from Mountfort and Carlton Streets is handled via the new structure and a median slot which makes it possible to operate the major intersection with but two signal phases with a maximum opportunity for establishing progressive movement through the intersection where this is necessary.

Under the proposed scheme, the new bridge may be reconstructed and put into service with the St. Mary's Street Bridge to enable reconstruction of the major intersection following which the St. Mary's Bridge may be demolished and the street closed off either side of the Turnpike-Rail right-of-way.

Preliminary profiles of the Boston University Bridge indicate an increase in the elevation of the intersection of over 5.5 feet which will mean that unless the Rail and Turnpike profiles undergo considerable lowering, the intersection will be forever hampered by a gradient of up to 6 per cent. Not only will vehicles be stopping on a six per cent slope in winter, but the M. T. A.

will be operating under a similar handicap. The entire area will require a great deal more study by the Consultants for the Turnpike Authority before the situation can properly be assessed. The indicated cost of lowering the Turnpike-Rail profile to re-establish existing grades in the intersection will probably total several millions of dollars since an indicated 1200 feet would have to be built as a waterproof and ballasted section with extensive utility relocations also required. The above grade condition makes the new structure even more important, since capacity at the intersection would be adversely affected by the current proposal for the six per cent grades.

Pedestrian Access

St. Mary's Street Bridge motorists will eventually use the new structure some 700 feet westerly of the old bridge. However, the pedestrian traffic, much of which originates and/or terminates east of the present St. Mary's street rail crossing, would be forced to travel an additional 1400 feet to accomplish the present trip desires. It is therefore felt that provision of comparable access would require a pedestrian access at this point, or possibly one further to the east opposite the point where Cummington turns to meet Commonwealth Avenue. It would seem reasonable that Brookline officials, and quite possibly, Boston University officials, would like an opportunity of studying alternate pedestrian

access locations in the event the present means of access via St. Mary's Street Bridge is eliminated. Fortunately, this is a matter which does not require an immediate decision since the time required for the design and construction of a pedestrian overpass structure is considerably less than for major bridge facilities and the construction timing can be phased with the demolition of the existing bridge.

The situation with regard to pedestrian traffic at the B. U. Bridge-Commonwealth Avenue intersection deserves some detailed consideration.

Previous pedestrian counts indicate a total East-West movement of over 820 individual crossings between 7:00 A. M. and 6:00 P.M.

Boston University officials have indicated that new dormitories for 1100 students, and plans for early construction for 500 more, are now under construction at the University Field, west of the intersection. Therefore, an additional 1600 persons will be using this intersection, adding to the present level of pedestrian traffic shown above. With this in mind, it appears that due consideration must be given to the construction of overpasses or underpasses.

Further, it is most desirable that pedestrian facilities be provided so that the capacity of the intersection will not be further reduced.

Beacon Street

The existing right-of-way equals 100 feet with a 70 foot pavement and 15 foot sidewalks on the north approach. The pavement on the south approach has a six foot median approximately centered on the pavement.

The design dimensions of this structure have not been discussed at any of the weekly meetings, however, the Turnpike proposes two 33 foot pavements, a five foot median and 14.5 foot sidewalks. Before a decision on the width of pavement and location of any median is made, a decision will have to be made relative to a proposed on-ramp westbound from Beacon Street. The placement of a ramp in this location with the need for storage of left turning vehicles would have to control the design. Once again, a City street is being raised and the indicated grades of two and five per cent on the north and south approaches respectively result in a design speed of 40 miles per hour. Again, any appreciable improvement in the profile will be a costly project.

The Consultants believe that serious consideration should be given to the placement at Beacon Street of a westbound on-ramp.

Certain improvements in Kenmore Square, which will be discussed in the next section of this report, will enable this area to handle a tremendous volume of traffic with minimum delay.

The Square is ideally located with respect to converging arterial routes such as Storrow Drive, Beacon Street, Commonwealth Avenue and even Brookline Avenue. Once reasonable peak hour traffic movement in the Square is assured, the tremendous value of an on-ramp leading directly from Kenmore Square is readily apparent.

Recent investigations utilizing a reduction to 11 foot lanes (a 44-foot pavement in each direction) at this point rather than waiting until reaching Massachusetts Avenue, indicates the possibility of accommodating this ramp without further land taking being required. In addition, the alignment of the roadway and railroad would have to be shifted southward and the retaining wall built substantially higher.

Brookline Avenue

The existing cross section of Brookline Avenue in the area of the Turnpike has a 40-foot pavement with a 10.5-foot walk on the westerly side and a 10-foot walk on the east. The Turnpike proposes a 40-foot pavement flanked with 10-foot sidewalks which appears to have all the required flexibility needed for future operations.

Because of profile difficulty, the Turnpike consultants proposed a study of possible alternate solutions for accommodating the grade differentials encountered.

The first solution, involving a realignment of Brookline Avenue into Beacon Street, was not considered acceptable because of restricted sight distances, generally poor geometrics and difficult traffic operations.

The second solution involved a reverse curve with substantial radii and, while not ideal, it would be acceptable if the Turnpike-Rail profile is not lowered.

Kenmore Square Area

The proposal for two phase operation of Kenmore Square involves the change to one way operation of Brookline Avenue which is an extension of a proposed one-way operational system for the Riverway and Brookline Avenue which is shortly to be effected jointly by the City and the M. D. C.

Also involved is the need for establishing a return truck route to compliment the Brookline Avenue route. This would involve the use of the New Charlesgate West Bridge, under the control of the M. D. C. , for the truck counter-movement to Brookline Avenue. The indications are that this could probably be arranged with the M. D. C. since the above scheme for Brookline Avenue, the Fenway and Kenmore Square has been a direct concern of the Commission for some time and the required change would improve operations on the overall M. D. C. system.

Charlesgate Area

While not directly under City control, the Charlesgates are most important to overall traffic operations. The M. D. C. and the Turnpike Authority have agreed to construct, in lieu of a temporary bridge and replacement of the existing structure, a dual bridge over the Turnpike and rail which will be part of a future overpass of the entire Charlesgate area between the Turnpike and Storrow Drive. Permanent ramps to and from Commonwealth Avenue will afford access to the new crossing. If the M. D. C. receives requested funds, the entire overpass structure may be completed simultaneously with the Turnpike construction in the area.

Also in this area, the possibility of "Air Rights" construction looms with the probability that parking area for tenants would be a necessary part of attracting financing. The subject of providing traffic service for this area and other potential "Air Rights" construction locations will have to be viewed on an individual project basis with a great deal depending upon the type of generator to be constructed and the parking which can be provided "over-the-site".

Massachusetts Avenue

The existing street right-of-way is 90 feet with 15 foot sidewalk flanking a 60 foot pavement. While this pavement width would permit three lanes in each direction, we recommend that a 70 foot width of pavement with 10 foot sidewalks would

permit the greatest flexibility in future traffic operations.

Because of the River Crossing, it is most likely that Massachusetts Avenue will have to operate as a two-way facility for the foreseeable future. With this in mind, a 70 foot pavement provides maximum opportunity to develop separate turn lanes at the intersections, if and when this becomes necessary.

Again, 'Air-Rights' will have to be considered on a specific project basis if and when this location is chosen for such development. The final pavement width at the corner of St. Clement's Church on Ipswich Street is expected to be so narrow that parking will have to be restricted for some distance in either direction. This route is required as an integral part of transit and truck operations in the area due primarily to restriction on commercial vehicles imposed by the M. D. C. on their road system. It therefore appears that Boylston Street will have to continue to operate two-way in the block between Massachusetts Avenue and Ipswich Street. If the Turnpike Authority is later forced to take all of the property in the above block between the relocated rail and Boylston Street, there would be a good opportunity to provide a separate roadway for this movement southbound, Massachusetts Avenue into Ipswich Street. Because of the situation at the Charlesgate East and Commonwealth Avenue, we have proposed that Newbury Street be reversed in operation so that it will operate one-way from Massachusetts Avenue to Charlesgate East and on out to Storrow Drive.

Massachusetts Avenue On Ramp

It is our recommendation that with the proposed traffic pattern and improved Kenmore Square traffic operations, the new Exeter Street on ramp and two-way operation of Massachusetts Avenue, there is adequate alternate service for the proposed Massachusetts Avenue ramp. The elimination of the ramp, in addition to saving construction costs will eliminate additional confusion and congestion on Massachusetts Avenue from turning vehicles. Any lessening of vehicle maneuvering at this busy location is most desirable.

The elimination may also help the Ipswich Street situation where width is already narrow. Ipswich Street should at least retain its existing width in the vicinity of St. Clement's Church. The Turnpike Extension narrows to two 44-foot pavements at this point, so no additional width can be gained in further narrowing the mainline pavement.

Boylston Street

The Turnpike proposes a 55-foot structure with sidewalks of 10 feet on the south side and 15 feet on the north side. Once again, in the interest of assuring the maximum degree of flexibility, without reducing pedestrian sidewalks below desirable minimums, we recommend a 60-foot pavement and 10-foot walks. This is based upon the possibility that this block between Hereford and Massachusetts may also have to operate two way to accommodate emergency vehicles responding from the police and fire stations located here. If an emergency vehicle lane is required, the additional width provided by a 60-foot roadway would be most advantageous.

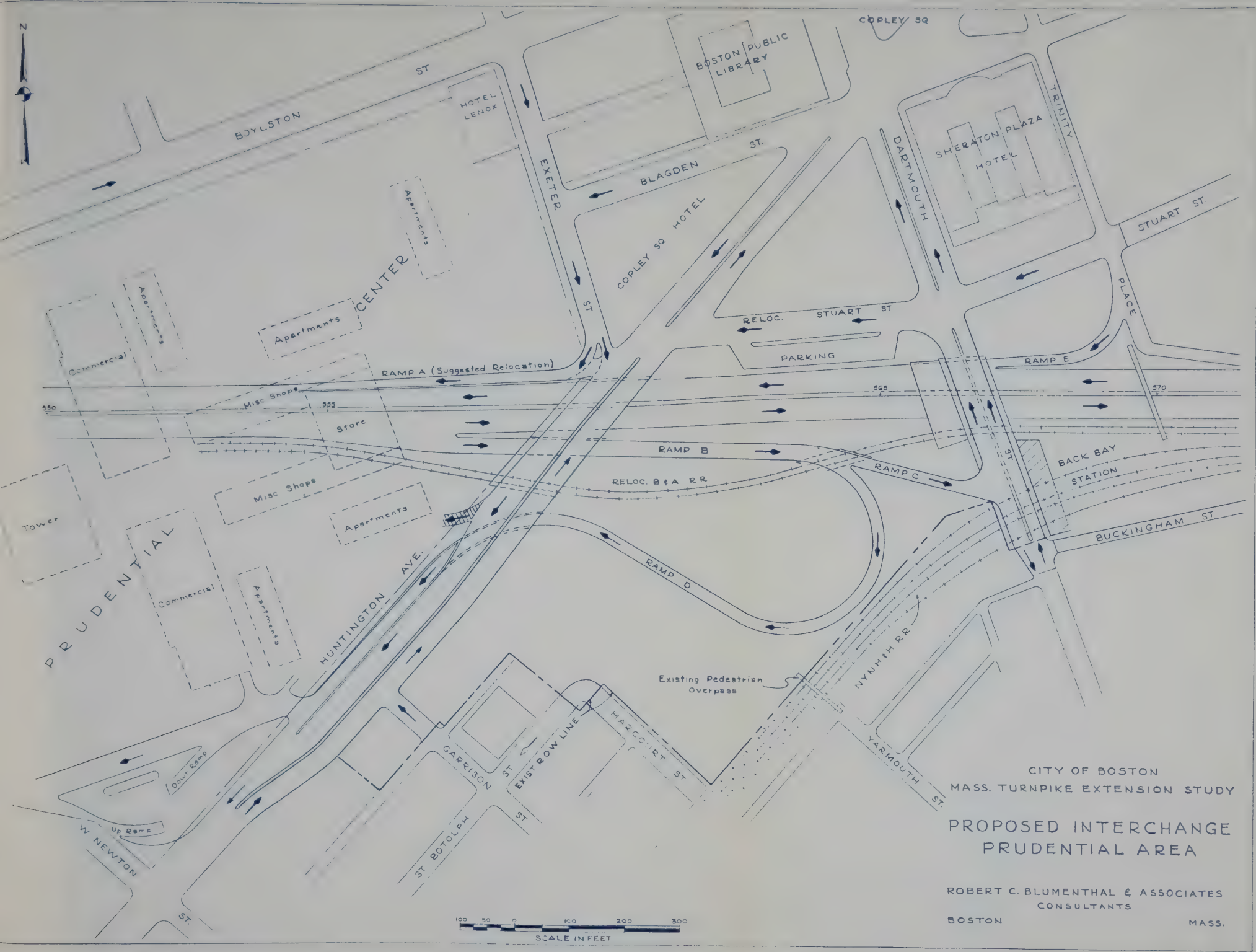
Dalton Street

The actual Turnpike crossing is under study by both the Turnpike's Consultants and by Consultants to the city. Our only comment is that the final intersection with Boylston Street and the Prudential Ring Road should be designed with the agreed upon one-way clockwise traffic pattern in mind. Traffic on Boylston street should not be permitted to enter the Prudential Ring Road at this point .

Huntington Avenue Interchange

The general objective of the proposed changes in this most important interchange are to maximize traffic service and safety while minimizing construction costs and land takings. In addition to the above, the proposed will insure greater development potential in the area between Huntington Avenue and Dartmouth Street. The recommended revision in interchange is shown on the following page.

The authority's consultants have indicated that they did not presume to change any of the existing traffic operations in the area when they were effecting the design of this interchange. Also, they were working under the assumption that the Prudential Ring Road and proposed building locations were not to be violated. It has since developed that there may be serious questions on the part of Prudential with respect to each of the above items.



If we may establish the design limitations as we discuss each element, the proposals may be more easily explained. First the Turnpike's on-ramp from Huntington Avenue was proposed when it was believed that there was not sufficient distance in which to drop a ramp from the corner of Exeter Street and Huntington Avenue down to clear the proposed Ring Road inside the Prudential Center. Also, they did not presume to reverse the flow of traffic on Exeter Street.

The City and Prudential have come to agreement on a one-way flow clockwise about the center for both Boylston and Exeter Streets. Therefore, Exeter Street is a natural collector for west-bound turnpike traffic, if one other obstacle can be overcome. The advisability of not making a continuous Ring Road is now being considered by Prudential officials who have become aware of the possibility of general traffic using their Ring Road as a by-pass if it is continuous.

By moving the ramp from the center of Huntington Avenue up to Exeter Street, some rather costly construction will be avoided and the tight geometrics which necessitated entering from the center of Huntington Avenue will be considerably improved.

The proposal to remove the off-ramp from the center of Huntington Avenue appears feasible and would eliminate the crossing maneuvers, required under the original proposal,

between Prudential Center traffic from the Turnpike and through traffic on Huntington Avenue. Further the construction of an entrance into the Prudential Center from Huntington Avenue prior to the off-ramp eliminates further confusion and maneuvering at the ramp terminal. If we now consider a one-way operation on Dartmouth Street from the off-ramp into Copley Square, we could, with this second off-ramp facility, provide all other desires and eliminate the previous ramp connection to Huntington Avenue leading to Copley Square. The proposal thus permits the elimination of both ramps and a left turn slot in the center of Huntington Avenue which will effect a simplicity of traffic operations in the area and a considerable saving in construction costs primarily through movement of the on-ramp and narrowing the Huntington Avenue structure by eliminating the no longer required left turn slot. The former ramp to St. Botolph Street served a limited area which is still accessible via either the Dartmouth Street or Huntington Avenue off-ramps.

The on-ramp from Stuart Street via Trinity Place is available at little cost, and will see heavy service since it will drain from Clarendon, Berkeley, Arlington, Tremont, and the other portions of the Downtown area from which traffic will find it easier than getting on the Central Artery to reach the Turnpike Extension.

Huntington Avenue

The Turnpike Authority and Prudential officials are still studying the basic changes suggested in the method of interchanging turnpike traffic in this area and it appears that firm commitments

will have to be made shortly as to what the ultimate scheme is to be so that the turnpike consultants may proceed with their design. Until these decisions have been made, the city is not in a position to agree upon the geometrics of the Huntington Avenue structure.

Dartmouth Street

Once again, until the overall interchange scheme is finalized the geometrics of this structure cannot be established. If the proposed ramp is to be built, then it will probably be necessary to operate Dartmouth Street two-way from the ramp to Tremont Street.

Stanhope Street

The Turnpike has expressed a desire to obtain agreement on the disposition of Stanhope Street where the total width at the tightest point between the face of retaining wall and the Otis Elevator Building is but 19 feet. Our suggestion is to operate one-way traffic, Trinity Place to Stanhope Street, and out to Clarendon Street with parking curtailed as required. This assumes that a suitable profile for the route can be developed.

Clarendon Street

The existing cross-section is uniform at 60 foot right-of-way with a 36 foot pavement and 12 foot sidewalks. The agreed-upon design geometrics were 10 foot sidewalks flanking a 40 foot pavement for future flexibility. Again an increase in the vertical curve is indicated on the preliminary profile, but the true assessment of how serious the final situation will be can only be determined

from the finished profile based on a field survey.

Columbus Avenue

Here, the 80 foot right-of-way includes two 30 foot pavements, separated by a four foot median and flanked by eight foot sidewalks. It was agreed that the interest of the city would best be served if the present cross-section were duplicated by the new structure, with the exception that the placement of a median be held pending operating decisions affecting this placement. Profiles indicate "humping" of intersection is not as severe as in many other locations, but still not equal to existing.

Berkeley Street

Present 80 foot right-of-way is devoted to 54 foot pavement, and 13 foot sidewalks. It was agreed that with five lane, one-way operation, there would be no conceivable need for additional lanes, and that a 56 foot pavement with 12 foot sidewalks would provide maximum flexibility required of future traffic operations.

Arlington and Tremont Streets

For all intents and purposes of design and operation, these two must be considered as a single structure. The result is that we are in effect considering the design of an intersection which we suggest be operated as shown in Exhibit 1, Sheet No. 2, with but two signal phases.

The phase allowing Arlington traffic to move into Castle Street, or into Tremont inbound, should have capacity for the

the storage of four lanes of traffic which would require a minimum of 44 feet of the 60 foot right-of-way and permit eight foot sidewalks.

The Tremont Street phase will have even more available space for storing vehicles at this approach. With a minimum 80 foot right-of-way, a 60 foot pavement and 10 foot walks would insure the required degree of flexibility to accommodate four or five lanes of through and one or two lanes right turning. Both the vertical and horizontal alignment refinements will have to await the development of plans at a more suitable scale and based on field survey. The plans of the city with regard to the improvement of Castle Street throughout the entire South End Project Area will have to be closely coordinated with those of the Turnpike Authority.

Perhaps one of the most critical phases of the Turnpike construction is the avowed intention to, wherever possible, meet existing spans over the New Haven Railroad since they have no agreements with that agency relative to work on any of the structures spanning the New Haven Railroad.

It seems quite obvious that it is impossible to design these structures over the Extension and relocated B&A rails and in every case establish a proper connection with the existing structure over the New Haven rails, even if the agreed upon width of the new structure were the same as that of the original.

Therefore, some understanding concerning this matter will have to be worked out. The Turnpike Authority appears to be reluctant to take the necessary steps. It further appears they might be willing to handle the overall construction and deal with the city rather than become involved with the New Haven Railroad Management, who in turn, lease the land in question from a Holding Company.

Shawmut Avenue

The existing road width is 40 feet with 10 foot sidewalks and the agreed upon width of 44 feet with eight foot sidewalks will permit two lanes in each direction, or four lanes in a one-way movement. The vertical alignment is subject to revision as final design progresses, and both plan and profile should be worked into the redevelopment plans for the area on both sides of the turnpike rail. During the discussions with the B. R. A. planners, the subject of providing for future changes in the M. T. A. was broached.

The potential problem with the Shawmut Avenue structure stems from a desire to extend the M. T. A. southerly on the New Haven Railroad right-of-way, possibly to a terminus in the vicinity of the New Haven's 128 Railroad Station in Westwood and Canton.

The above would permit the abandonment of the Washington Street overhead structure out to Forest Hills, but a major

problem is how to negotiate the shift in alignment from underground subway to a location on the railroad right-of-way. Two schemes of affecting the approximately 90-degree shift in alignment were discussed as follows:

1. An overhead route which would come out of the ground and clear the Washington Street roadway structure over the Turnpike Extension as it turns westward and drops to reach the level of the present rails.
2. A sub-surface route passing below Washington Street and the Turnpike to connect to the railroad tracks.

The latter would be the more expensive proposal, but more desirable from land use considerations. With the underground scheme, the location of the proposed Turnpike Extension Bridge piers would be critical. With the overhead scheme, the Shawmut Avenue structure over the Turnpike Extension provides a formidable problem in design.

Washington Street

The present alignment of Washington Street varies in this area. The pavement, either side of the Turnpike-rail alignment, varies between 33 and 34 feet with 8 to 10-foot sidewalks.

The agreed upon alignment would hold the present Easterly Street line (next to the M. T. A.) and move westerly on a 64 foot right-of-way, with 48 foot pavement and 8 foot sidewalks.

Washington Street may revert to two-way operation to fit into the scheme of redevelopment planning and thus two good lanes in each direction are assured. If one-way operation is used, then four lanes will be available. Again, final vertical alignment and proper coordination with the city's plans on either side will have to await more detailed plans from the Turnpike Authority.

Harrison Avenue

Present right-of-way varies from 52 feet to 100 feet with a single 32 foot pavement to 33 foot divided pavements with a 14 foot median and 10 foot walks. It was agreed that a tentative design for the Harrison Avenue structure would include a 48 foot pavement and 8 foot sidewalks. This would permit four lanes under proposed operation and if two-way operation were desired, it would still permit two lanes in each direction.

Final vertical alignment is awaited before further comment is warranted. As with the previous structures connected with redevelopment projects, joint planning will be necessary as more accurate maps are available from the Turnpike.

Broadway

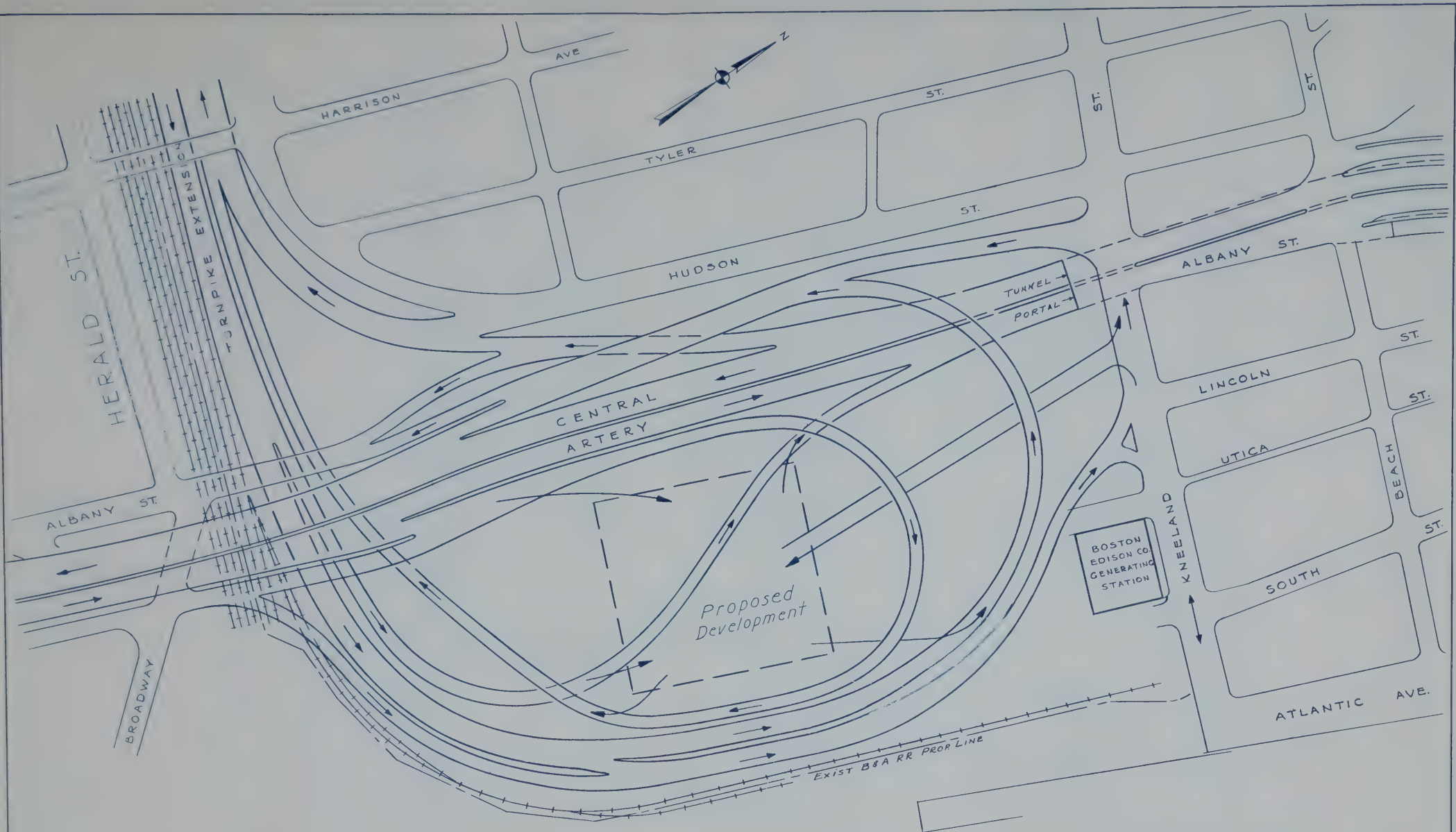
As discussed previously, the Design Consultants for the Turnpike Authority are having great difficulty in working out problems with this structure. The elimination of the Broadway Bridge, coupled with certain changes in operation, would not cause undue hardship on area traffic movements. On the contrary, the suggested changes in traffic operations will permit attainment of design and parcelization objectives by virtue of the elimination or relocation and deemphasis of Broadway in the South Cove Project Area. The Castle-Albany Street intersection operation will also improve with simplification resulting from the elimination of several heavy turning movements. The Central Artery rampage works ideally with the proposed scheme for making Dover and Castle Streets a one-way couple. The proposed street pattern also aids in the recommended revision to the South Station interchange.

Turnpike Central Artery Interchange

The proposed Interchange between the Turnpike and the Central Artery is predicated upon the availability of a certain amount of railroad property, as indicated in the appended Exhibit 5. This question is under further study and a completely different interchange could be worked out subject to the amount of land available.

The following discussion limits itself to a modification in the proposed interchange that would be necessary and desirable and would require no additional land takings.

Page 63 shows a plan of proposed modifications which retains



CITY OF BOSTON
MASS TURNPIKE EXTENSION STUDY

PROPOSED INTERCHANGE CENTRAL ARTERY

ROBERT C. BLUMENTHAL & ASSOCIATES
CONSULTANTS
BOSTON MASS.

the high design standards, reroutes some local traffic movements, and at the same time makes available a substantial area for possible development.

The present local traffic movement from Broadway and from the Central Artery via ramp and service road, to Kneeland Street has been removed from the Center of the Interchange and placed on the outer fringe of the Interchange. The weaving maneuver that would result from bringing Ramp E together with Ramp R is resolved and these movements are replaced as shown in the illustration.

In any event, it is our understanding that future connections from the Turnpike Mainline and from the Turnpike Interchange ramps to the South Station Area and to South Boston are feasible and can be designed and constructed at any time that the problem of access through the railroad yards is resolved.

Summary of Affected Structures

The tabulation on the following page presents the existing rights of way apportioned between sidewalk and traveled pavement, the initial proposals of the Turnpike Authority for replacement of structures and the accepted or recommended cross section of structures affected.

While accepted or recommended cross sections are shown, it is entirely possible that these will require further refinement, either because of traffic operational requirements or structural problems, as the preliminary design phase progresses. Where no accepted or recommended cross section appears, there is either a lack of survey information or a pending decision which will affect the geometrics of the particular structure.

C R O S S S E C T I O N S

<u>STRUCTURE</u>	<u>EXISTING APPROACH(S)</u>	<u>TURNPIKE PROPOSAL</u>	<u>ACCEPTED OR RECOMMENDED</u>
Dalton Street	None	None	
Huntington Avenue	10' 36' 5' / 36' / 10'	10' / 33' / 5' / 70' / 10'	8' / 48' N / 5' / 36' / 8'
Dartmouth Street	10' / 40' / 10'	10' / 50' / 10'	8' / 48' / 8'
Clarendon Street	12' / 36' / 12'	12' / 36' / 12'	10' / 40' / 10'
Columbus Avenue	8' / 30' / 4' / 30' / 8'	13' / 54' / 13'	8' / 64' / 8'
Berkley Street	13' / 54' / 13'	12' / 56' / 12'	12' / 56' / 12'
Arlington Street	7' / 46' / 7'	7' / 46' / 7'	7' / 46' / 7'
Tremont Street	13' / 54' / 13'	10' / varies / 10'	10' 60' / 10'
Shawmut Avenue	10' / 40' / 10'	8' / 44' / 8'	8' / 44' / 8'
Washington Street	8-10' / 33' - 34' / 8' - 10'	9.5' / 36' / 9.5'	8' / 48' / 8'
Harrison Avenue	10' / 32' / 10' N 10' / 33' / 14' / 33' / 10' S	10' / 50' / 10'	8' / 48' / 8'
Broadway	10' / 40' / 10'	8' / 46' / 8'	Abandonment Recommended

NOTE: Cross sections are viewed looking north at the structure. Ex: 8' / 26' / 8' / 30' / 8' - 8 foot sidewalks and median with 26 foot southbound pavement and 30 foot northbound.

BRIDGES AFFECTED BY TURNPIKE CONSTRUCTION

C R O S S S E C T I O N S

<u>STRUCTURE</u>	<u>EXISTING APPROACH(S)</u>	<u>TURNPIKE PROPOSAL</u>	<u>ACCEPTED OR RECOMMENDED</u>
Brooks Street	7'/26'/7'	Replace Existing	7'/30'/7'
Parsons Street	8'/34'/8'	Replace Existing	7'/36'/7'
No. Beacon Street	10'/40'/10'	10'/30'/8'/30'/10'	8'/26'/8'/30'/8'
Market Street	10'/50'/10'	8'/54'/8'	8'/54'/8'
Everett Street	Var. - 30' minimum	Replace Existing	7'/30'/safety walk
Cambridge Street (Mainline)	12'/45'/10'	6'/34'/6'-14'/34'/6'	8'/34'/6'/34'/7'
Cambridge Street (Ramps)	12'/45'/10'	6'/34'/6'/34'/6'	6'/34'/6'/34'/6'
Commonwealth Avenue	29' walk/42'/36'-38' Median/32'-34'/21'-34' walk, EXISTING 23.5'/36'/40'/37'/20.5' TURNPIKE PROPOSAL - See Scheme A		
New structure over Mainline 50' roadway - See Scheme A			
St. Mary's Street	7'/26.7'/7'	6'/28'/6'	Pedestrian structure
Beacon Street	North 14.9'/31.8'/6.0/32.4'/14.2' South 15'/70' pavement/15.0'	14.5'/33'/5'/33'/14.5'	10'/80'/10'
Brookline Avenue	10.5'/40'/10'	10'/40'/10'	10'/40'/10'
Massachusetts Avenue	15'/60'/15'	15'/60'/15'	10'/70'/10'
Boylston Street	15'N/55'/10'S	15'/55'/10'S	10'/60'/10'

NOTE:
For Legend See Sheet No. 2



CITY OF BOSTON
MASS. TURNPIKE EXTENSION STUDY

SKETCH PLAN
PROPOSED STREET PATTERN

ROBERT C. BLUMENTHAL ASSOCIATES
CONSULTANTS

BOSTON MASS.
August 1, 1962



CITY OF BOSTON
MASS. TURNPIKE EXTENSION STUDY

SKETCH PLAN
PROPOSED STREET PATTERN

ROBERT C. BLUMENTHAL ASSOCIATES
CONSULTANTS

BOSTON MASS.

August 1, 1962



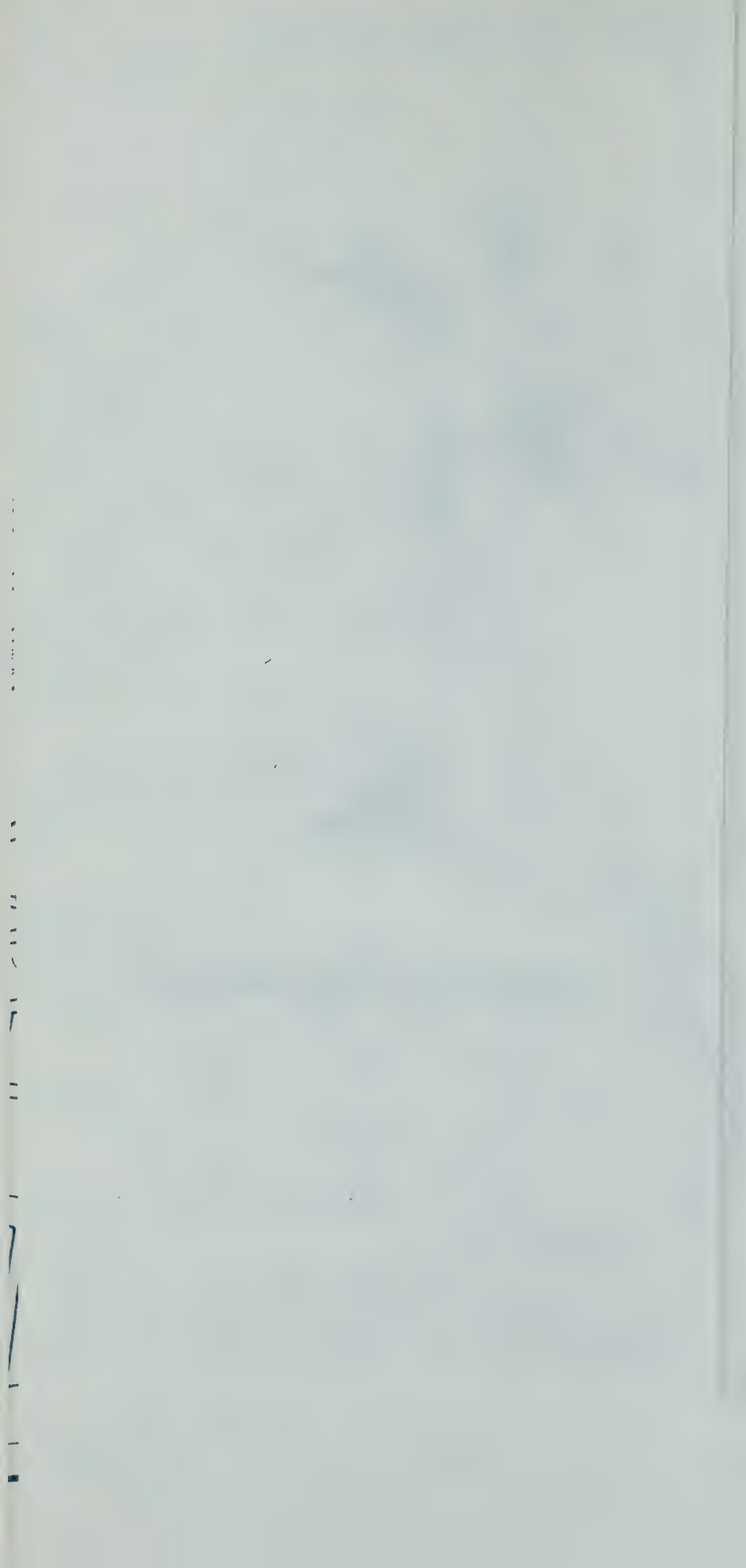


CITY OF BOSTON
MASS. TURNPIKE EXTENSION STUDY

P.M. PEAK HOUR
TRAFFIC FLOW DIAGRAM

ROBERT C. BLUMENTHAL ASSOCIATES
CONSULTANTS

BOSTON MASS



Estimated 1965 Average Daily Traffic
shown thus: "31,500" →

EXHIBIT 1 SHEET 3 OF 3



CITY OF BOSTON
MASS. TURNPIKE EXTENSION STUDY

ESTIMATED A.A.D.T.
TRAFFIC FLOW DIAGRAM

ROBERT C. BLUMENTHAL ASSOCIATES
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BOSTON MASS





CITY OF BOSTON
MASS. TURNPIKE EXTENSION STUDY

P.M. PEAK HOUR
TRAFFIC FLOW DIAGRAM

ROBERT C. BLUMENTHAL ASSOCIATES
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BOSTON MASS.



CITY OF BOSTON
MASS. TURNPIKE EXTENSION STUDY

ESTIMATED A.A.D.T.
TRAFFIC FLOW DIAGRAM

ROBERT C. BLUMENTHAL ASSOCIATES
CONSULTANTS
BOSTON MASS.

Scale in Feet
0 100 200 300 400 500 600

1955 Average Daily Traffic
plus 100,000

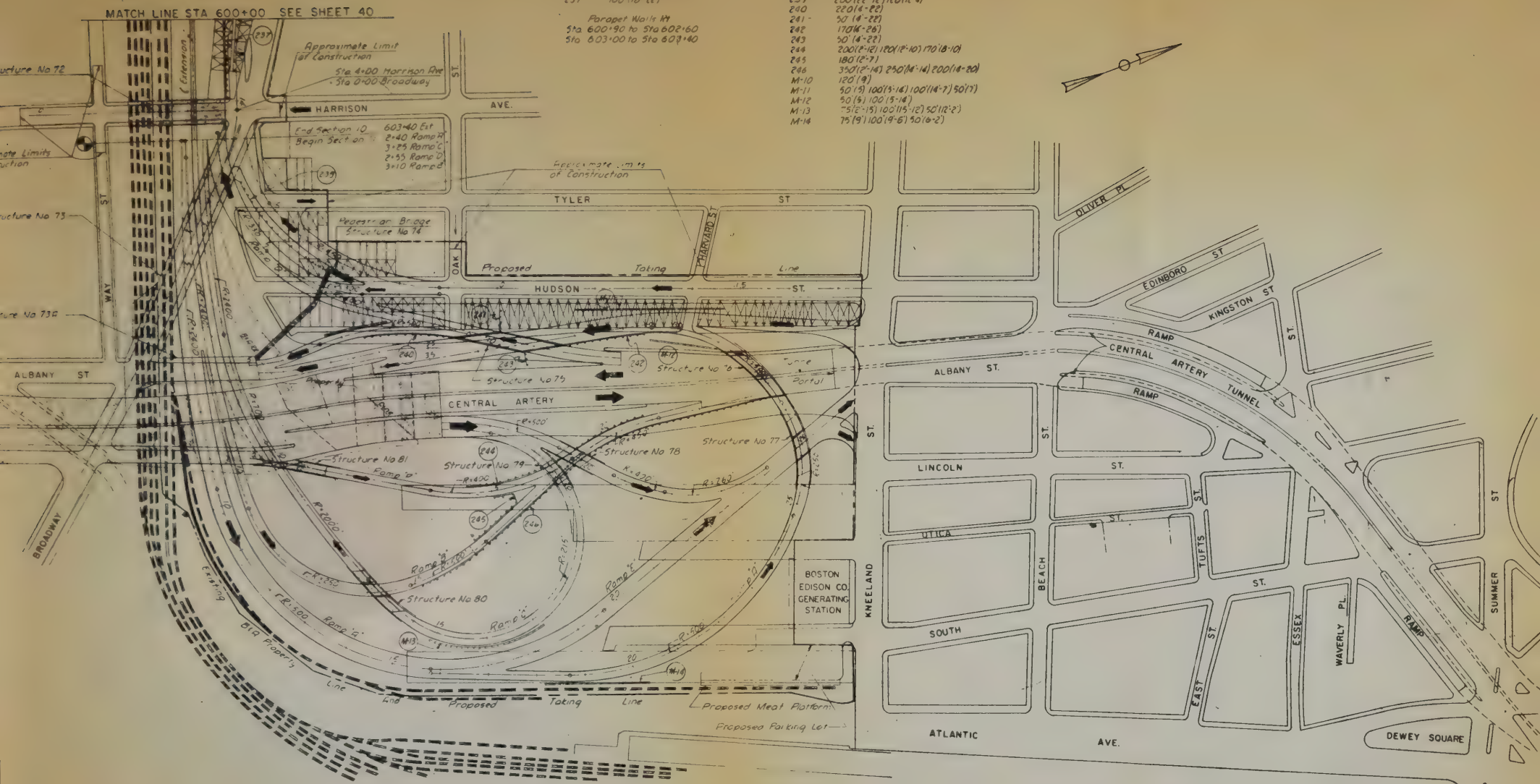
Section 10 Retaining Wall

Wall No	Dimensions
237	100'118'-22'

Parapet Wall H
Sta 600+90 to Sta 602+60
Sta 603+00 to Sta 603+40

Section 11 Retaining Wall

Wall No	Dimensions
239	200'122'-120'118'-4'
240	220'14'-22'
241	50'14'-22'
242	170'16'-26'
243	50'14'-22'
244	200'122'-120'118'-10'
245	180'12'-7'
246	350'12'-14' 250'14'-14' 200'14'-20'
M-10	120'18'
M-11	50'13' 100'13'-14' 100'114'-7' 50'17'
M-12	50'13' 100'13'-14'
M-13	5'12'-15' 100'115'-12' 50'112'-2'
M-14	75'19' 100'19'-6' 50'10'-2'



Section 11
Parapet Wall R1
Ramp 7: Sta 1+80 to Sta 4+70
Ramp 9: Sta 6+80 to Sta 9+00

NOTE
For Profiles of Harrison Ave. and Broadway,
See Sheet No. 45.
For Ramp Profiles, See Sheet No. 42.
General layout shown, including alignment,
profile and width of ramps, is subject to detailed
development on the basis of later field surveys,
final traffic estimates and other relevant data.

MASSACHUSETTS TURNPIKE AUTHORITY
BOSTON EXTENSION
CENTRAL ARTERY INTERCHANGE

HTW 314 60" 3 Ramp Widths Rev. WEB 4-61
2 Rev. Mass. Turnpike CHP 9-80
REG 830-60 1 288A Tracks HTW 9-60
CHP

T35 B4

Blumenthal

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Massachusetts Turnpike
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